

C.3 GEOSPACE SCIENCE

1. Scope of Program

Proposers interested in submitting in response to this program element are encouraged to also read Appendix C.1 for an overview of the Sun-Earth Connection (SEC) Division of the NASA Office of Space Science.

The Geospace Science program seeks to understand the region of space that surrounds and is influenced by the Earth and its magnetic field, beginning with the investigation of the terrestrial neutral upper atmosphere, including the mesosphere and thermosphere, and extending outwards through the ionosphere, into, and beyond the magnetosphere. This program also supports studies of magnetospheric processes at other solar system bodies. These studies are supported with the goal of enabling the achievement of NASA's strategic goals and objectives. The primary Research Focus Area (RFA, see Table 1 in the *Summary of Solicitation* of this NRA) supported by the Geospace Science program is RFA II.SEC 1.c:

"Understand the response of magnetospheres and atmospheres to external and internal drivers."

Other areas to which Geospace Science contributes are RFAs II.SEC 2.a and II.SEC 2.b

"Discover how magnetic fields are created and evolve and how charged particles are accelerated," and

"Understand coupling across multiple scale lengths and its generality in plasma systems."

Priority for selection is given to those proposals that most clearly demonstrate the potential for making significant contributions in these areas, especially those demonstrating direct benefit to NASA future mission planning. It should be noted in this regard that the next two Solar Terrestrial Probes with Geospace focus are the:

- Magnetospheric MultiScale mission whose primary objective is the understanding of the fundamental processes of reconnection, and
- Geospace Electrodynamics Connections mission, with a primary objective of understanding the coupling between the ionosphere-thermosphere system and the magnetosphere.

There have, in the past, been two components of the Geospace Science program element, the Geospace Supporting Research and Technology (G/SR&T) and the Geospace Low Cost Access to Space (G/LCAS) programs. In Fiscal Year (FY) 2003, approximately two-thirds of the total Geospace Science funding supported SR&T investigations and one-third was invested in the G/LCAS program.

Beginning in FY 2005, portions of the previously separate Sun-Earth Connection Instrument Development Program (Sec C.6) will be managed as elements of the Solar and Heliospheric Physics and Geospace Science SR&T programs. This new management structure is

acknowledged in this NRA through the inclusion of a new Geospace Instrument Development (G/ID) component in the Geospace Science program

Note that to enable the NASA Office of Space Science to properly evaluate the relevance of proposals submitted to its programs, as well as track its progress towards achieving its goals as mandated by the Government Performance Review Act (GPRA), all research supported by NASA's programs must now demonstrate its relationship to NASA Goals and Research Focus Areas (RFAs) as stated in the latest version of its Strategic Plan (follow links from the Web site <http://spacescience.nasa.gov/>); see also the discussion in Section I of the *Summary of Solicitation* of this NRA. Therefore, all proposers to this program element are asked to state their perception of this relevance in terms of the Goals, Science Objectives, and RFAs given in Table 1 found in the *Summary of Solicitation*. In particular, this program element is designed to help fulfill RFAs 1.c, 2.a, and 2.b of Goal II for the Sun-Earth Connection science theme. The appropriate place for this statement of relevancy is in the introduction to the proposal's "Scientific/Technical/Management" section (see Section 2.3.5 in the *Guidebook for Proposers*). The index numbers in this table may be used to identify a specific RFA, for example, "Goal I, Sun-Earth Connection Theme, RFA 1(c)" or "Goal II, Astronomical Search for Origins, RFA 3(b)."

1.1 Geospace Supporting Research and Technology Program

The Geospace Science SR&T component supports individual research tasks that employ a variety of research techniques in pursuit of Geospace program goals. Specifically, the Geospace Science SR&T program supports theoretical research, the development and exercise of models and simulations, and the analysis and interpretation of data for the purposes of identifying and understanding the physical processes important to geospace structure and dynamics.

The development and testing of new instrument concepts, new observing techniques, new models, and/or new data analysis techniques that are pertinent to discipline goals are also supported. However, proposals for such efforts must provide an explanation of the relationship between such proposed efforts and clearly defined Geospace Science goals. The Geospace SR&T program supports the development of laboratory instrument prototypes, but not of flight hardware. The Geospace Science SR&T program annually supports ~100 awards, with an average annual funding of \$80K per award.

1.2 Geospace Low Cost Access to Space Program

The G/LCAS program supports research in magnetospheric, ionospheric, thermospheric, and mesospheric physics that requires the space-flight of instrumentation. The program offers a variety of methods for providing low cost access to space, including standard and long-duration balloons, sounding rockets, Shuttle-based payloads, and sounding rocket-class payloads flown as secondary payloads or on other flights of opportunity. The G/LCAS program annually

supports approximately 15 investigations, each with an average annual funding of \$250-300K per investigation.

1.3 Geospace Instrument Development Program

The G/ID program supports the development of spacecraft-based instrument technologies that show promise for use in scientific investigations on future Geospace science missions. The goal of the program is to define and develop scientific instruments and/or components of such instruments to the point where complete instruments may be proposed in response to future announcements of flight opportunity without additional extensive technology development. Wholly new measurement concepts may be proposed, as well as methods that may significantly improve the performance of existing instruments and/or the development of technologies that enable the packaging of multiple instruments in order to minimize the need for spacecraft resources (e.g., volume, power, telemetry, and mass). Instrument definition and development studies may be proposed that take place at several stages, ranging from feasibility studies of entirely new instruments, to conceptual design, to laboratory breadboarding of critical components and/or complete instruments. For immature or very complex new instruments, proposers initially may choose to propose only to define or develop only the most risky components by way of a proof-of-concept, then to follow with proposals for the next stage. However, in all cases of component-only development, one or more likely scenarios for possible follow-on instrument development should also be described.

The instrument technology development proposed through this program must address the scientific objectives of the proposed instruments in the context of the specific scientific objectives of candidate future Geospace Science missions.

It is anticipated that the scientific payloads on most future Geospace Science missions will be limited to small, low mass, low power consumption, and low cost instruments. Therefore, proposals for instrument definition and development satisfying these general specifications are especially solicited.

It is expected that there will be approximately \$800K available in Fiscal Year 2005 to support the G/ID program, all of which is obligated to ongoing awards. Thus, while it is expected that G/ID funding will become available for competition in FY 2006, no G/ID proposals are solicited in this current NRA.

1.4 Restrictions on Program Scope

Objectives that are outside the scope of this Geospace Science program that should not be proposed are as follows:

- Efforts focused on the science of those particular aspects of the Sun-Earth system that directly affect life and society are not appropriate for the Geospace Sciences program,

but may be submitted to the Living with a Star program (see Appendix C.7 of this NRA);

- Proposals for efforts intended to maximize the return from ongoing SEC missions that heavily utilize mission specific data from operating spacecraft are more appropriate for the SEC Guest Investigator program (see Appendix C.5);
- Proposals with the intent of extending or supplementing investigations selected for current approved space flight missions are not appropriate for this NRA;
- None of the components of the Geospace Science program supports the routine, long-term gathering of observational data;
- Proposals for the development of new instruments for missions already selected for flight or selected for Explorer Phase A study and/or development are not appropriate for the G/ID program; and
- Some areas of study within the Sun-Earth Connection theme overlap with research objectives supported by other OSS disciplines. In particular, proposals dealing with the following disciplines are outside the purview of the Geospace program: the interaction of the solar wind and/or magnetospheric plasmas with solid body surfaces, the neutral components of planetary toruses, rings, and/or atmospheres of extra-terrestrial planets; and the chemistry and/or dynamics of the lower, neutral terrestrial atmosphere (i.e., below the mesosphere)

2. Programmatic Information

2.1 Geospace Supporting Research and Technology

In past years, SR&T programs have permitted grants to be made separately to the Principal and Co-Investigators of the same investigation, but at different institutions, in order to avoid the overhead costs associated with subawards. However, this practice has been discontinued except in those unique cases where a Co-Investigator is affiliated with a U.S. Government Laboratory (see the *NASA Guidebook for Proposers*), in which case NASA separately funds that Co-Investigator through a direct transfer of funds. Separate Co-Investigator awards are also permitted in the LCAS program discussed below. In all other cases the PI institution is expected to fund any participating Co-I(s).

2.2 Geospace/Low Cost Access to Space (LCAS)

Proposers may submit budgets for up to three years to cover a complete suborbital investigation, including payload construction, launch phase, and data analysis.

It is necessary to minimize the operational costs to NASA for payload preparation and field operations for its Research Carriers programs. Investigators are, therefore, strongly encouraged to propose investigations that minimize these operational factors, especially with regard to payload complexity and nontraditional launch sites. Therefore, all those who intend to

propose to the G/LCAS program are strongly urged to discuss prospective investigations with operations personnel at the NASA Wallops Flight Facility to ensure that probable operational costs are properly anticipated. Questions concerning sounding rockets may be addressed to:

Mr. Philip Eberspeaker
Sounding Rocket Program Office
Code 810
Wallops Flight Facility
National Aeronautics and Space Administration
Wallops Island, VA 23337
Telephone: (757) 824-2202
E-mail: Philip.J.Eberspeaker@nasa.gov

Proposers anticipating the use of balloon payloads should be aware that the balloon operations budget is under severe pressure and has recently been able to support only a fraction of anticipated flights. It is therefore particularly important that prospective balloon PI's contact balloon operations personnel. Questions concerning balloon operations may be addressed to:

Mr. Craig Purdy
Balloon Office
Wallops Flight Facility
National Aeronautics and Space Administration
Wallops Island, VA 23337
Telephone: (757) 824-1453
E-mail: Craig.L.Purdy@nasa.gov

Sounding Rocket Launch Sites. The two standard U.S. launch sites for sounding rockets are White Sands Missile Range (WSMR), New Mexico, and Wallops Island, Virginia. Although launches from Poker Flat Rocket Range (PFRR) in Alaska require support from mobile launch crews, they do not require separate "campaign" proposals (see below). However, prospective proposers should be aware that PFRR is not open for operations every year; current plans call for PFRR to be open during the winter of 2004-05 and then closed in the winter of 2005-2006. Also, campaign proposals are not required for the use of the established non-U.S. launch sites at Andoya and Svalbard, Norway, or Kiruna, Sweden. Finally, prospective investigators should note that NASA sounding rocket flights from WSMR require the payment by NASA of significant fees. While the current operations budget contains sufficient funds to support a small number of flights from WSMR every year, it is difficult to accommodate investigations with extended launch windows at WSMR.

Campaigns for Multiple Launches. In addition to flights from WSMR, Wallops Island, and PFRR, the G/LCAS program has historically been able to support up to one campaign per year consisting of a series of rockets flown from a common but nonstandard launch location.

Campaigns are usually planned several years in advance. The currently scheduled campaigns are for PFRR during the winter of 2004-2005 and for Kwajalein Island, in 2004.

In proposing for a campaign, the following protocol must be followed:

- A Campaign Scientist must submit a "Campaign Summary" proposal describing the overall effort and listing prospective investigations that address the rationale for requesting the proposed launch site; the desired launch time, and/or other special launch conditions (Moon-down, night time, etc.); any expected non-U.S. involvement; required ground and/or airplane support; and any other information that defines the overall scope of the proposed campaign.
- Each investigator who wishes to participate in a campaign must submit a separate investigation proposal, each of which will be independently reviewed. Clear cross-reference must be made to the Campaign proposal on the proposal Cover Page.

Proposals from Multiple Institutions. Proposals for suborbital investigations often involve the development of payloads that require major hardware collaborations from several organizations. In such cases, lead Principal Investigators (PIs) may propose a direct subcontracting arrangement between his/her organization and the Co-Investigator (Co-I) institution(s), in which case all the nominal instructions in the *NASA Guidebook for Proposers* (see further below) apply.

Alternatively, significant cost savings for NASA may be achieved by providing separate awards to each collaborating institution, where the lead investigator from each Co-Investigator institution serves as the "Institutional PI" for the award to his/her institution (see Section 1.4.2 in the *NASA Guidebook for Proposers*). Therefore, in order to provide for such multiple-award flexibility, the following instructions may be followed for proposals that involve major hardware contributions from multiple institutions:

- Only the "lead proposal" for the overall investigation, submitted by a single PI, will be reviewed. This primary proposal must include the PI's work statement and budget, plus appended Task Statements and budgets from all other collaborating Co-I institutions (see further below) as part of its Budget Details. The *Cover Page/Proposal Summary/Budget Summary* of the lead proposal should show only the budget requested by the lead organization. However, the Budget Details of this lead proposal must include a table that shows the costs for the lead organization plus those for each Co-I institution, which together must add to the total yearly requests for the entire, integrated investigation for its complete period of performance.
- The Task Statement(s) from collaborating Co-I institution(s) that are to be included in the lead proposal are not to exceed five pages each and must include a description of the Co-I institution's contribution to the overall investigation, the roles of that institution's

Co-I(s) (if more than one, a single Co-I to serve as the “Institutional PI” must be identified), and a copy of the *Budget Summary* that is submitted with that Co-I institution’s independent proposal to NASA (see below).

- Finally, each Co-I institution must also submit a formal, signed proposal to NASA that is prefaced with the *Cover Page/Proposal Summary/Budget Summary* materials indicated in the *NASA Guidebook for Proposers*. Such “Co-I proposals” must clearly cross-reference the lead proposal in the first sentence of their *Proposal Summary*, which must also be identical to, and use the same investigation title as, that of the lead proposal. The *Scientific/Technical/Management Section* of this Co-I proposal (see the *NASA Guidebook for Proposers*) is to consist only of the five-page Task Statement noted above. However, it must include a full institutional budget that covers that Co-I’s proposed activities.

G/LCAS program proposals selected under this NRA will be phased into the program as rapidly as resources permit. As a rule, new investigations are awarded definition-level funding in their first year, full funding for development in their second year, leading to flight early in their third year, which concludes with data analysis.

Owing to the larger scope and personnel involvement in G/LCAS proposals, the page limit for the Science/Technical/Management Section given in the *NASA Guidebook for Proposers* is revised from the default standard of 15 pages to 20 pages instead.

3. Programmatic Information

Total funding for the FY 2005 Geospace Sciences program is expected to be approximately \$12.8M. It is anticipated that approximately \$4M of this funding will be available for competition in the G/SR&T and G/LCAS programs FY 2005.

IMPORTANT INFORMATION

The *Summary of Solicitation* of this NRA points out that NASA Headquarters now uses a single, unified set of instructions, entitled *NASA Guidebook for Proposers Responding to NASA Research Announcements*, that provides detailed guidance for the preparation and submission of proposals to most of its NRA’s. By reference is the current edition, *Guidebook for Proposers– 2004*, is incorporated into this Office of Space Science solicitation and is accessible by linking through the menu item “Helpful References” at the Web site <http://research.hq.nasa.gov> or it may be directly accessed at <http://www.hq.nasa.gov/office/procurement/nraguidebook/>. Proposers to this Program Element are urged to familiarize themselves with this document, in particular its Chapters 1, 2, and 3, before preparing a proposal. This NRA’s *Summary of*

Solicitation also contains the schedule and instructions for the electronic submission of both a *Notice of Intent* (NOI) to propose, as well as a proposal's *Cover Page/Proposal Summary/Budget Summary* for the proposal, and the mailing address for the submission of proposals.

Questions about this program element may be directed to the cognizant Program Officer:

Dr. Mary Mellott
Sun-Earth Connection Division
Office of Space Science
Code SS
NASA Headquarters
Washington, DC 20546-0001
Telephone: (202) 358-0893
E-mail: Mary.M.Mellott@nasa.gov
